

In: F Lacanilao, RM Coloso, GF Qunitio (Eds.). Proceedings of the Seminar-Workshop on Aquaculture Development in Southeast Asia and Prospects for Seafarming and Seafarming; 19-23 August 1991; Iloilo City, Philippines. SEAFDEC Aquaculture Department, Iloilo, Philippines. 1994. 159 p.

SEAFARMING AND SEAFARMING IN THAILAND

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ABSTRACT

Seafarming is undertaken in the coastal sublittoral zone. Different marine organisms such as molluscs, estuarine fishes, shrimps (pen culture), and seaweeds are cultured along the coast of Thailand. Seafarming, especially for mollusc, is the main activity in Thailand. The important species are blood cockle, oyster, green mussel, and pearl oyster. In 1988, production was approximately 51,000 metric tons in a culture area of 2,252 hectares.

Artificial reefs have been constructed in Thailand since 1987 to enhance coastal habitats. Larvae of marine organisms have also been restocked in the artificial reef area.

INTRODUCTION

The total coastline along the Gulf of Thailand and Andaman sea is approximately 2,600 kilometers. A relatively long period has been spent in surveying coastal area for suitable aquaculture and this resulted in the rapid expansion of coastal aquaculture in Thailand.

Different marine organisms such as molluscs, estuarine fish, and seaweeds are cultured along the coast of Thailand.

MOLLUSC FARMING

Mollusc culture has been practiced in Thailand for more than 100 years. In the early days, fishermen cultured molluscs by collecting spats from natural grounds. At that time, culture practices were traditional, developed by people living along coastal areas suitable for mollusc farming. Mussel and oyster culture originated from gathering of spats from abandoned stakes of fixed fish traps, and subsequently grown on bamboo poles and palm trunks. Bottom culture of cockles and, to some extent, mussel culture was also practiced. Rock culture of oysters, using cement blocks and natural rocks, is now common. Numerous improvements have since been introduced to increase production.

Species which are collected from natural grounds and cultured are the following:

	Species	English Name
1.	<i>Anadara granosa</i>	blood cockle, ark shell
2.	<i>Anadara nodifera</i>	blood cockle, ark shell
3.	<i>Perna viridis</i>	green mussel
4.	<i>Modiolus senharrsenri</i>	horse mussel
5.	<i>Saccostrea commercialis</i>	oyster
6.	<i>Crassostrea lugubris</i>	oyster
7.	<i>Crassostrea belheri</i>	oyster
8.	<i>Pinctada maxima</i>	gold lipped pearl oyster
9.	<i>Pinctada margarifera</i>	black lipped pearl oyster

Only the first seven in the list are described in this paper. The pearl oysters are mostly used for the pearl business rather than for human consumption, and their culture methods are kept secret.

In 1988, mollusc culture area covered a total of 2,252 hectares. These are divided into green mussel (351 hectares), horse mussel (86 hectares), blood cockle (1,198 hectares), and oyster (617 hectares). Estimated production of cultured mollusc and those collected from natural grounds is about 44,236 tons green mussel, 1,858 tons oyster, 4,652 tons cockle, and 652 tons horse mussel (Table 1).

Blood Cockle

The blood cockles farmed in Thailand and Malaysia belong to the *genus Anadara*, family *Arcidae*, and generally inhabit fine muddy bottom near the shoreline.

Suitable sites for cockle culture are estuarine areas and along the coastline with muddy bottom and with seawater salinity of above 13 parts per thousand. They are usually in wind-sheltered bays with a river or canal to bring in food supply. A suitable area should have a bottom slope below 15 degrees to prevent

Table 1. Mollusc culture in Thailand showing total culture area production and value during 1984-1988

Species	1984			1985			1986			1987			1988		
	Area (ha)	Prod'n (tons)	Value	Area (ha)	Prod'n (tons)	Value	Area (ha)	Prod'n (tons)	Value	Area (ha)	Prod'n (tons)	Value (xUS\$,1,000)	Area (ha)	Prod'n (tons)	Value (xUS\$,1,000)
Blood Cockle	1,473	12,512	-	1,911	12,375	-	1,589	6,928	-	1,665	9,609	1,770	2,041	4,652	1,265
Green Mussel	365	26,217	-	420	25,906	-	498	11,905	-	491	23,949	1,756	583	44,236	3,740
Oyster	988	4,851	-	969	3,516	-	995	580	-	1,028	1,483	699	1,049	1,258	1,017
Horse Mussel	46	1,608	-	90	361	-	87	272	-	87	818	1,022	87	652	77
Pearl Oyster	53	1,608	-	43	-	-	43	-	-	43	-	-	63	-	-

cockles from being moved by wave action. Water depth should preferably be between 0.5 and 1.0 meter and the exposure period should not exceed 2-3 hours a day. In addition, the culture area should have low population of predators.

Oyster

There are four species of oysters widely distributed along the coast of Thailand. Three, *Saccostrea commercialis*, *Crassostrea lugubris*, and *Crassostrea belcheri*, are commercially cultured.

Oysters require a hard substratum for attachment and can thrive on wood, stone, or rock substrate. Three principal methods of oyster culture are used: the stake, stone or concrete block, and the hanging (raft and longline) methods. *Saccostrea commercialis* are cultured by the sowing method on hard, sandy, and rocky bottoms. Most suitable areas for oyster culture are located near river mouths which are protected by natural or artificial barriers against strong wind and wave action.

The salinity level should not drop below 9.5 parts per thousand for long periods and the water should contain enough nutrients for plankton production. Water depth can be 1.0-2.0 meters (below mean sea level), and the exposure period should not be more than 2-3 hours a day during spring tides.

Green Mussel

The cultivation of green mussels in Thailand follows the traditional system of collecting on stationary fishing gear, or on bamboo poles. There are three basic methods for green mussel culture which are similar to the method practiced in oyster farming.

Green mussels are distributed along the entire coastline of Thailand and are particularly abundant near river mouths. Suitable areas for green mussel culture should have a salinity of 15-32 parts per thousand. Water depth should be 1-4 meters below mean sea level. Phytoplankton productivity should be optimum with regard to species composition and abundance to sustain high productivity.

Horse Mussel

Horse mussel is another bivalve species widely distributed along the coastline of Thailand. It requires hard bottom with a good mixture of silt, sand, and mud in order to thrive. They inhabit shallow waters with depths usually less than 2 meters and may be exposed for short period (less than 1 hour a day) during low tides.

This mussel requires a different habitat from that of the green mussel and, like cockles, usually grows on the bottom of intertidal zones.

At present, horse mussel is cultured only in Chanburri province (inner Gulf of Thailand) in an area of 240 hectares. No specific survey has been done

on horse mussel culture. However, it is assumed that this species requires an aquatic environment similar to cockles, except for the texture of the bottom substrata.

SHRIMP PEN CULTURE

Pen culture of the tiger shrimp (*Penaeus monodon*) has been practiced in Thailand since 1987. Postlarvae (50 days old) are stocked at a rate of 100-200 per square meter nylon pen of 36 square meters. Suitable sites for pen construction are found along the river mouths with water salinity of 10-31 parts per thousand and depth of 2-5 meters. Artificial feed and trash fish are given 3-4 times a day. Harvesting is usually done on the fourth month when the shrimps have reached a size of 28 grams. Production is about 100 kilograms per pen (Table 2).

SEAWEEDS

Thailand does not use large quantities of seaweeds, hence these are only harvested from natural beds. The Department of Fisheries is conducting research on the feasibility of mass propagation, particularly of some species of *Gracilaria* and *Polycavernosa*. These are widely found in Trat, Chanthaburi, Songkhla, and Pattani provinces. Local fishermen collect and dry the seaweeds, which are sold to middlemen and mostly exported. Price is about US\$1.20 per kilogram.

ARTIFICIAL REEFS

Due to decline in coastal fisheries catch in Thailand, the government realized the urgent need for coastal resource enhancement. A program to construct artificial reefs was first developed in Rayong in 1987 to enhance fish stocks.

Materials such as used tires and concrete blocks have been used for artificial reef construction. Several shapes and appropriate models have been developed in many coastal areas of the country.

The young marine organisms, such as fish fingerlings, shrimp fry, mollusc larvae, have been restocked in the artificial reef area. Post-deployment studies were carried out. They include: 1) materials, shapes, and depths at Rayong, 2) models, fishing records, and subsidence rates at Songkhla, 3) models for deterring the operation of trawlers and purse seine at Nakhorn Srithammarat, Songkhla, and Pattani, and 4) fishing record, species composition, and siltation places adjacent to and away from estuarine areas at Satun.

The Department of Fisheries cooperated with Southeast Asian Fisheries Development Center to conduct studies on oceanography (physical and chemical), biology, and socioeconomics at Rayong and Petchburi.

Table 2. Pen culture of tiger shrimp in Thailand showing total culture area, production and value during 1987-1990

Province	1987			1988			1989			1990		
	Area (sq m)	Prod'n (kg)	Value (xUS\$,1,000)	Area (sq m)	Prod'n (kg)	Value (xUS\$,1,000)	Area (sq m)	Prod'n (kg)	Value (xUS\$,1,000)	Area (sq m)	Prod'n (kg)	Value (xUS\$,1,000)
Bangpakong	1,980	3,575	21	10,080	18,200	109	14,400	26,000	156	15,012	15,012	163
Songkhla				11,850	14,163	113	97,000	11,155	89	64,000	32,000	256

The following are considerations before artificial reefs are deployed:

1. Fishing gears prevailing in the locality. For example, artificial reefs should be deployed deeper than 15 meters if hook and line prevails in the area.
2. The models of artificial reef in relation to fish habitat.
3. Water depth should be deeper than 7 meters.
4. Current, wave, and wind.
5. Artificial reefs could accelerate coral reef formation. Buoys are placed as markers for fisherfolk in those areas.
6. Cost should not exceed US\$30 cubic meter or US\$15 per square meter and should last longer than 7 years.

According to the Sixth National Social Economic Development Plan, artificial reef deployment is targeted to cover at least 100 square kilometers for conservation purposes.

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